CHAPTER 1

Overview

The Catalyst 2900 series XL modules add port density and high-performance connectivity to a Catalyst 2900 series network. When installed in the appropriate Catalyst 2900 series switch, these modules support a full range of cabling types, port connectors, and 10, 100, and 1000 megabit-per-second (Mbps) transmission speeds. All the Catalyst 2900 series modules autonegotiate the duplex mode of each port to match that of the attached device. The Ethernet and Fast Ethernet modules also autonegotiate the speed settings of each port.

This chapter contains the following topics:

- Key features of the modules
- Descriptions of the module LEDs
- Module cabling guidelines
- Examples of how the modules can be deployed

The Catalyst 2900 series modules support Inter-Switch Link (ISL) and IEEE 802.1Q trunking or multi-virtual LAN (VLAN) ports. The following table describes the modules by model number.

Model Number[1]	Description
WS-X2914-XL-V	4 autosensing 10/100 UTP ports
WS-X2922-XL-V	2 100BaseFX ports
WS-X2932-XL	1 1000BaseT port
WS-X2924-XL-V	4 100BaseFX ports
WS-X2931-XL	1 1000BaseX port

1. If you insert these modules into a Catalyst 2912MF XL (WS-C2912MF-XL) or Catalyst 2924M XL switch (WS-C2924M-XL-A or WS-C2924M-XL-EN), they support up to 8192 MAC addresses on each switch. If you insert any of these modules into a Catalyst 2916M XL switch (WS-C2916M-XL), they support up to 2048 MAC addresses on each switch.

Note To use the ISL and IEEE 802.1Q trunking features, you must enable them by using the Enterprise Edition Software. These features cannot be used with the standard edition software.

Key Features

Table 1-1 describes the module features in detail.

Table 1-1 Catalyst 2900 Series XL Modules Features

Module	Feature
WS-X2931-XL (1 1000BaseX port) WS-X2932-XL (1 1000BaseT port)	• Hot-swappable • Management through an SNMP management station, the Cisco IOS command-line interface (CLI), or the web-based Visual Switch Manager (VSM) • Autonegotiation of duplex mode and flow control • IEEE 802.1Q VLAN trunk support • ISL trunk support • Up to 8192 MAC addresses on each modular switch

Table 1-1 Catalyst 2900 Series XL Modules Features (continued)

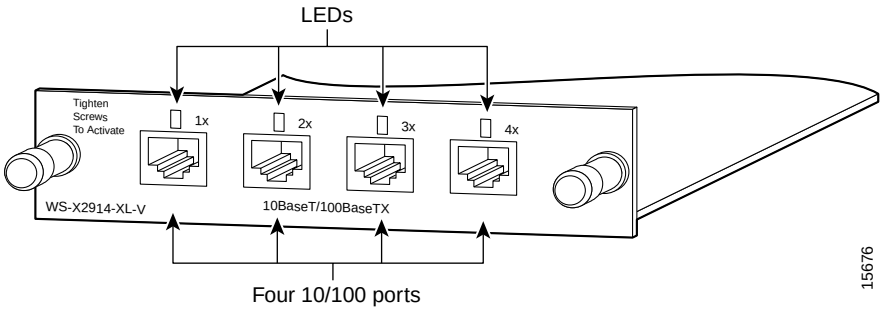
Module	Feature
	• Support for Catalyst 2900 XL series Cisco IOS Release 12.0(5)XU or later • Gigabit EtherChannel support • Gigabit Interface Converter (GBIC) field-replaceable interface for Catalyst 2931XL 1000BaseSX and 1000BaseLX/LH modules • IEEE 802.3x, 802.3z, and 802.3ab compliant[1]
WS-X2914-XL-V (4 10/100 UTP ports) WS-X2922-XL-V (2 100BaseFX ports) WS-X2924-XL-V (4 100BaseFX ports)	• All switched ports • Autonegotiation of speed and duplex on the 10BaseT/100BaseTX module • Per-port data rates of up to 200 Mbps in full-duplex mode • Hot-swappable • Management through an SNMP management station, the Cisco IOS command-line interface (CLI), or the web-based Visual Switch Manager (VSM) • Fast EtherChannel support on all ports • IEEE 802.1Q virtual LAN (VLAN) trunk support • ISL trunk support • Up to 8192 MAC addresses on each modular switch • Support for Catalyst 2900 XL series Cisco IOS Release 11.2(8)SA4 or later

1. Catalyst 2900 Series XL modules support the relevant IEEE 802.3x, IEEE 802.3z, or IEEE 802.3ab protocols appropriate for that module.

10BaseT/100BaseTX Module

The10BaseT/100BaseTX module, hereafter referred to as the 10/100 module, has four switched 10/100 autosensing ports. The ports can autonegotiate the transmission speed, or they can be set to 10 Mbps or 100 Mbps. Ports can also be set to half duplex, full duplex, or autonegotiate. Figure 1-1 shows the 10/100 module.

Figure 1-1 10/100 Module



The 10/100 module is compatible with the IEEE 802.3 10BaseT standard and the IEEE 802.3u 100BaseT standard. The ports use RJ-45 connectors and Category 5 unshielded twisted-pair (UTP) copper cabling. For connector and schematic information, see Appendix B, “Connectors and Cables.”

100BaseFX Modules

The 100BaseFX modules have either two or four switched 100BaseFX ports for 100-Mbps fiber-optic connectivity. The ports can run in half-duplex or full-duplex modes. The module support the IEEE 802.3u 100BaseT standard and use standard, duplex, SC connectors. Figure 1-2 and Figure 1-3 show the 100BaseFX modules.

Figure 1-2 2-Port 100BaseFX Modules

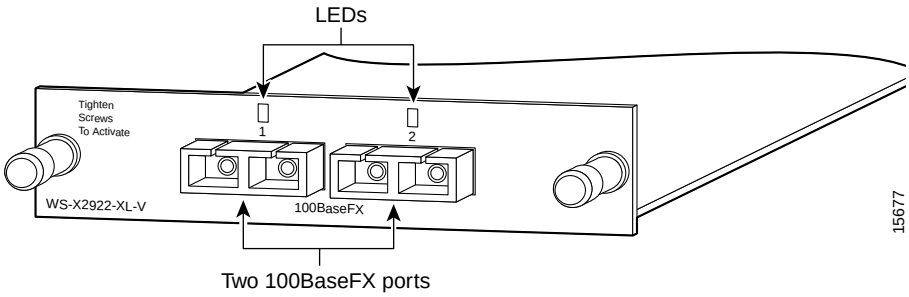
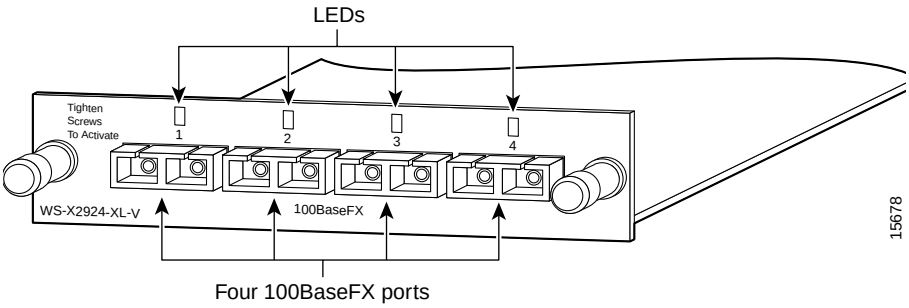


Figure 1-3 4-Port100BaseFX Modules

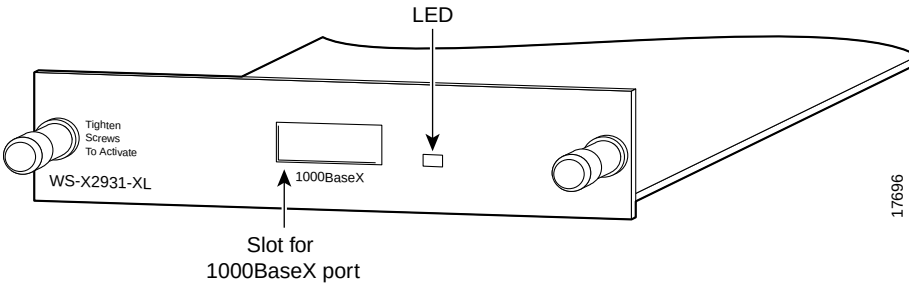


For connector and schematic information, see "100BaseFX and 1000BaseX Modules Cabling" in Appendix B, "Connectors and Cables."

1000BaseX Module

The 1000BaseX module, shown in Figure 1-4, provides one switched 1000-Mbps, full-duplex port that uses an SC fiber-optic connector. The port supports the IEEE 802.3z 1000BaseX standard. For connector and schematic information, see "100BaseFX and 1000BaseX Modules Cabling" in Appendix B, "Connectors and Cables."

Figure 1-4 1000BaseX Module



GBICs for the 1000BaseX Module

You can install either a short-wavelength (SX) or a long-wavelength/long-haul (LX/LH) GBIC into the 1000BaseX module. Figure 1-5 shows a GBIC, and the GBIC types are listed in Table 1-2.

Figure 1-5 GBIC

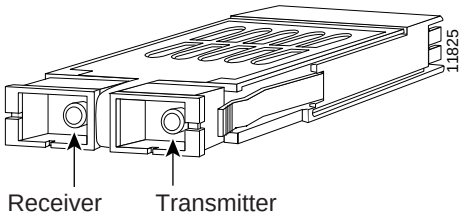


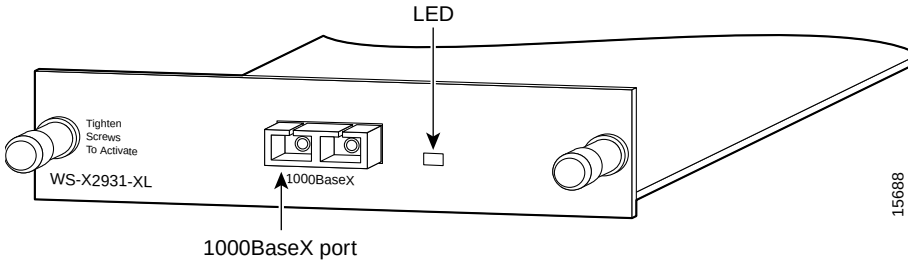
Table 1-2 GBIC Types

GBIC	Part Number
Short wavelength (SX)	WS-G5484=
Long wavelength/long-haul (LX/LH)	WS-G5486=

Note GBICs are sold separately from the 1000BaseX modules. Cisco supports some approved third-party GBICs. For more information, refer to the *Catalyst GigaStack Gigabit Interface Converter Hardware Installation Guide*.

The GBICs fit through cutouts in the front of the module and plug into connectors on the module.

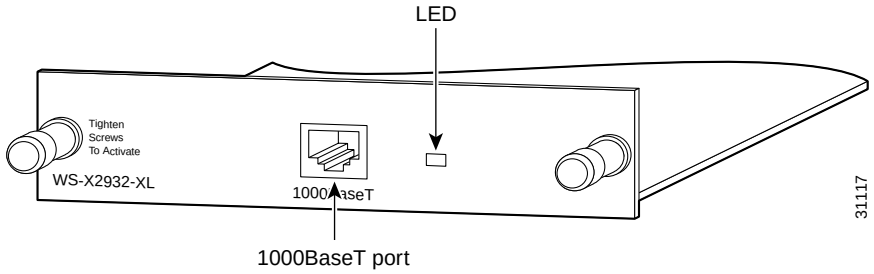
Figure 1-6 1000BaseX Module with GBIC Installed



1000BaseT Module

The 1000BaseT module, shown in Figure 1-7, provides one switched 1000-Mbps, full-duplex port over UTP copper cabling. The 1000BaseT module port supports the IEEE 802.3ab standard.

Figure 1-7 1000BaseT Module



The “10/100 Module Cabling” section in the “Connectors and Cables” appendix describes the RJ-45 connector.

LEDs

An LED above or next to each port reflects the port status, as described in Table 1-3.

Table 1-3 Port LEDs

Color	Meaning
Off	No link.
Green	Link present.
Flashing green	Activity; port is transmitting or receiving data.
Alternating green-amber	The port is experiencing error frames that can affect connectivity. The port monitors errors such as excessive collisions, cyclic redundancy check (CRC) errors, and alignment errors.
Amber	Port is not forwarding because • It is initializing • It was disabled by management or by an address violation • It was blocked by Spanning Tree Protocol

Cabling Guidelines

This section describes the cabling guidelines you need to consider when planning your network.

10/100 Module

The 10/100 ports require Category 5 UTP cabling. Attached devices must be within 100 meters of the port and be either 10BaseT or 100BaseTX compatible.

The 10/100 ports are numbered 1X through 4X. The X indicates that the pins on the port connector are internally crossed. If you are connecting to a device with ports marked with an X, such as another switch or hub, use a crossover cable. If you are connecting to devices with ports not marked with an X, such as a PC, workstation, or server, use a straight-through cable.

For the connector pinouts and schematics, see the section "10/100 Module Cabling" in Appendix B, "Connectors and Cables."

Note Always observe the following general rules when connecting devices: Use a straight-through cable to connect two ports when one is designated with an **X**; use a crossover cable to connect two ports when both are designated with an **X**.

100BaseFX Modules

The 100BaseFX ports use 50/125- or 62.5/125-micron multimode fiber-optic cabling with duplex SC connectors. When set to run in full-duplex mode, 100BaseFX module ports can connect to compatible devices over distances of up to 2 kilometers. For connector and schematic information, see Appendix B, "Connectors and Cables."

1000BaseX Modules

GBICs require the following fiber-optic cables with duplex SC connectors.

Table 1-4 GBIC Cable Specifications

GBIC	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz.km)	Cable Distance Maximum
Shortwave (SX)	850	MMF	62.5	160	722 ft (220 m)
			62.5	200	902 ft (275 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)

Table 1-4 GBIC Cable Specifications (continued)

GBIC	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz.km)	Cable Distance Maximum
Longwave/Long-haul (LX/LH) (Patch cord installation is required for distances exceeding 300 m.)	1300	MMF	62.5	500	1804 ft (550 m)
			50.0	400	1804 ft (550 m)
			50.0	500	1804 ft (550 m)
Longwave/Long-haul (LX/LH)	1300	SMF (LX/LH)	9/10		32,810 ft (10 km)

1000BaseT Module

The 1000BaseT port requires Category 5 UTP cabling. Attached devices must be within 100 meters of the port and be 1000BaseT compatible.

For the connector pinouts and schematics, see the section "1000BaseT Module Connectors" in Appendix B, "Connectors and Cables."

Deployment Examples

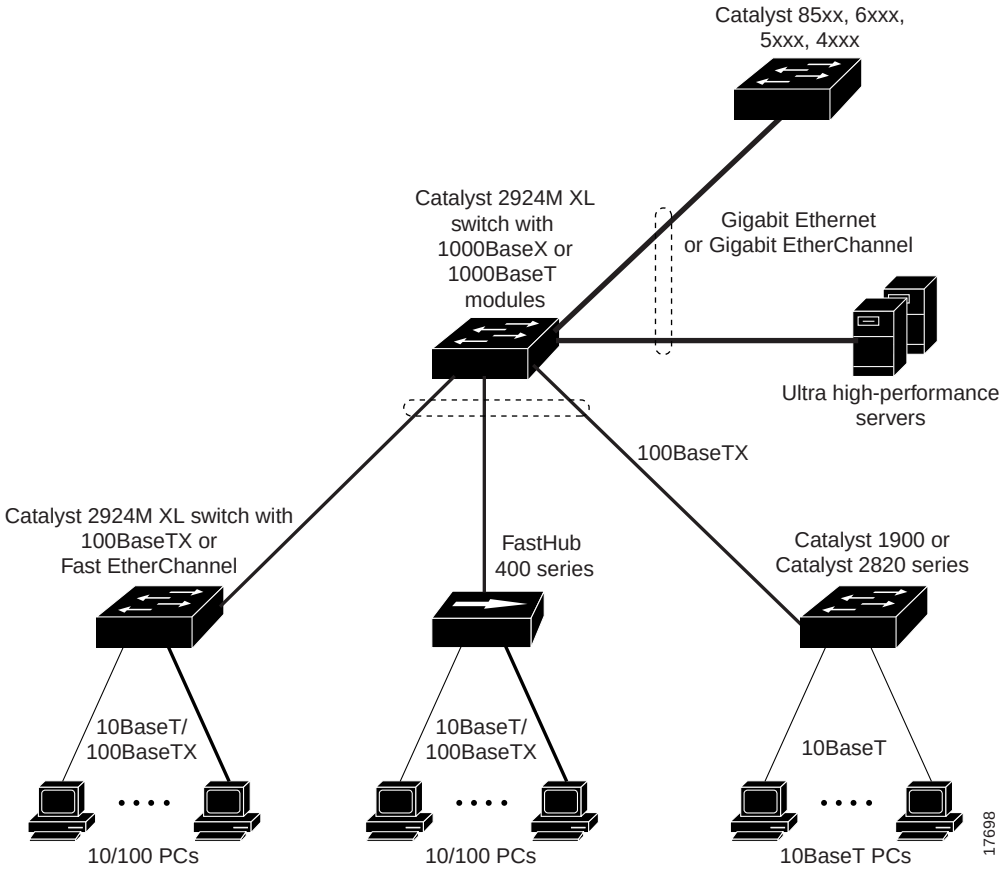
This section describes five examples that use Catalyst 2900 series modules:

- Network with gigabit uplink
- Aggregating traffic from switched and shared networks
- Fast EtherChannel backbone
- Small to medium-sized LAN backbone
- High-performance client-server workgroups

Gigabit Uplink

Figure 1-8 shows a ultra-high-performance client-server workgroup. Catalyst 2900 series switches with 10/100, 1000BaseX, and 1000BaseT modules installed connect the PCs and create a gigabit Ethernet or gigabit EtherChannel link to an ultra-high-performance server supporting the Fast EtherChannel feature.

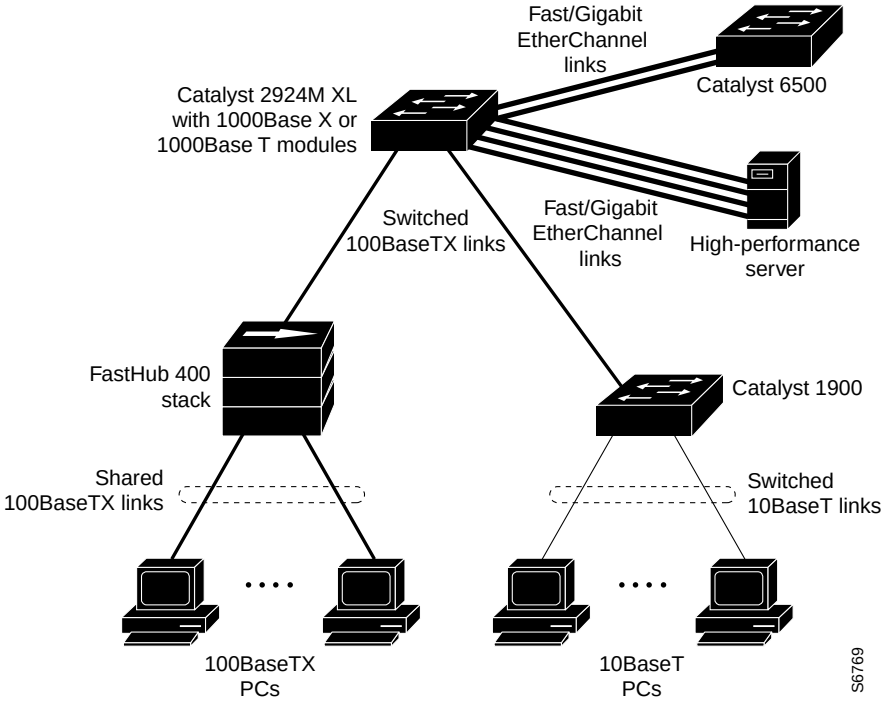
Figure 1-8 Gigabit Uplink Client-Server Workgroup



Wiring Closet Aggregator

Figure 1-9 shows a Catalyst 2924M XL switch aggregating traffic from shared 10BaseT, switched 100BaseTX, and switched 10BaseT networks. A 100BaseFX module passes the traffic to a backbone switch or router, and a 10/100 module links the switch through a Fast EtherChannel link to a high-performance server.

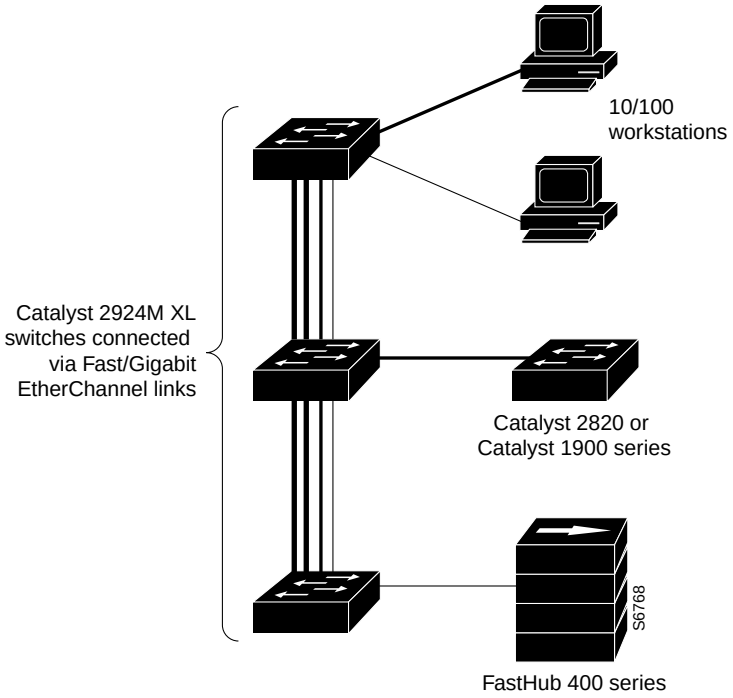
Figure 1-9 Wiring Closet Aggregator



Fast or Gigabit EtherChannel Backbone

Figure 1-10 shows three Catalyst 2924M XL switches creating a high-speed backbone for 10/100 PCs, Catalyst 2820 or Catalyst 1900 series switches, and stacked FastHub 100BaseTX repeaters.

Figure 1-10 Fast EtherChannel Backbone

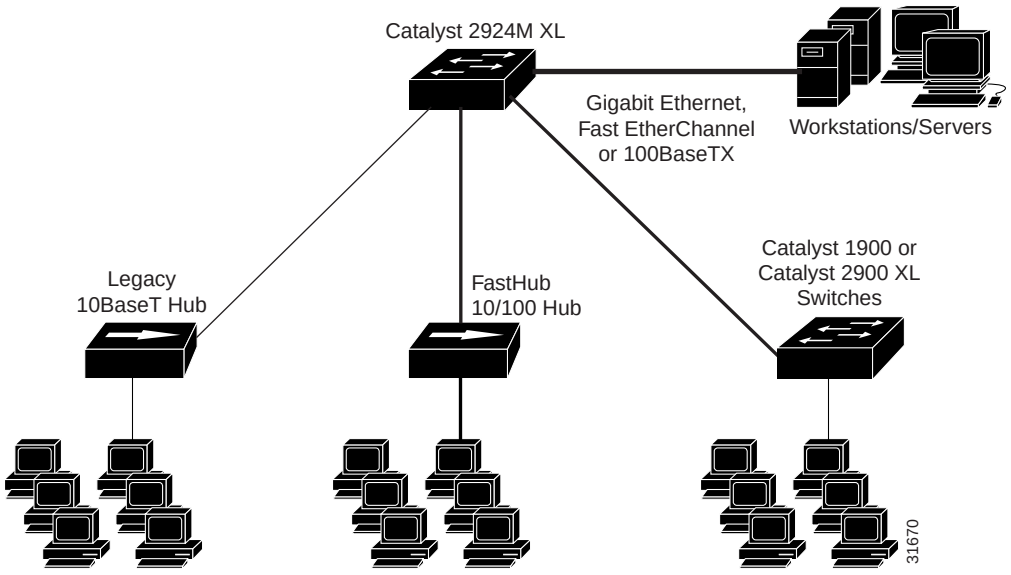


Backbone for Small- to Medium-Sized LAN

Figure 1-11 shows a Catalyst 2924M XL switch used as a corporate network backbone of a small to medium-sized LAN, providing high-speed access to the corporate servers using the Fast EtherChannel link.

This configuration provides a cost-effective migration path from legacy shared 10-Mbps networks to switched Fast Ethernet and gigabit Ethernet networks.

Figure 1-11 Small- to Medium-Sized LAN Backbone



High-Performance Workgroup

Figure 1-12 shows a high-performance client-server workgroup. A Catalyst 2924M XL switch with a 10/100 module installed connects the PCs and creates a four-port Fast EtherChannel link to a high-performance server supporting Fast EtherChannel.

Figure 1-12 High-Performance Client-Server Workgroup